UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,495	11/13/2003	Frank Jansen	M02A430	8327

7590 11/08/2005

Ira Lee Zebrak
The BOC Group, Inc.
Legal Services - Intellectual Property
100 Mountain Ave.
Murray Hill, NJ 07974

EXAMINER	
ABRAMOWITZ, HOWARD E	
ART UNIT	**PAPER NUMBER**
1762	

DATE MAILED: 11/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/712,495	JANSEN, FRANK	
	Examiner	Art Unit	
	Howard E. Abramowitz	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 September 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *1-10* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-20* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election of group II the method claims in the reply filed on 5/25/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Response to Amendment

In the response to the first office action filed 9/16/05 the applicant made no amendments.

Response to Arguments

Applicant's arguments filed 9/16/05 have been fully considered but they are not persuasive. The applicant has argued Sneh does not teach that the gas flows from the auxillary chamber (booster chamber) to an inlet of the process chamber solely under a pressure gradient.

The examiner argues that the bulk flow of gas is do to either a pressure gradient or electrophoresis (not the case in Sneh). Even if a pump were being utilized (not the case in Sneh) the pump merely acts to increase the pressure of the gas at one end inducing a gradient which causes the flow. Furthermore the word pressure means a force per unit area so that any force applied to the gas would result in a pressure gradient driven flow. Even if the flow was temperature driven the flow would be do to a

change in density which corresponds to a change in pressure of the gas so that temperature driven flow is in fact pressure driven flow. In a less abstract sense the flow of Sneh is caused by pressure in a booster chamber see paragraphs 46 and 47. The fact that there is a "synchronous modulation of the flow and draw" does **not** mean that the flow to the chamber is driven by another means besides pressure. It simply means that the flow into the chamber, which is pressure driven, is equivalent to the flow being drawn from the chamber, which is also pressure driven by the use of a vacuum. The use of flow regulators or valves or any other method to control the flow does not change the fact the flow of the gas to the process chamber is solely under a pressure gradient. The examiner submits that nowhere in Sneh is any other driving force besides pressure disclosed (a vacuum or draw is a pressure gradient driving force and electrophoresis is not mentioned).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 11-17 rejected under 35 U.S.C. 102(e) as being anticipated by Sneh (US Patent Application Publication 2003/0180458).

Referring to claim 11, Sneh discloses a method of delivering precursor gasses for an ALD process comprising filling a first booster chamber with a first chemical reactant (paragraph 46) and filling a second booster chamber with a second chemical reactant (paragraph 47). To fill these chambers, chemical-dosage shut-off valves (110 and 110') between the booster chambers and the atomic layer deposition chamber must be closed (figure 1, table 1). The chamber is purged between adding each reactant at a pressure below that of the pressure during the dosage of the reactants (paragraph 87, table 1, table 3). To add each chemical reactant the valves (110 and 110') must be opened to allow the reactants to flow into the reaction chamber. The process runs in the general procedure of: adding the first reactant (opening its shut-off valve); purging (closing the 1st shut off valve); adding the second reactant (opening its shut off valve); purging (closing 2nd shut off valve) and repeating that sequence of steps (paragraphs 14-19, table 1). This process is run solely under a pressure gradient (paragraph 38, paragraph 89).

Referring to claims 12 and 13 Sneh discloses purging with an inert gas at a reduced pressure in between the steps of adding the reactants (paragraph 10, table 3).

Referring to claim 14, Sneh discloses that the first reactant can be trimethylaluminum (paragraph 152).

Referring to claim 15, Sneh discloses that the second reactant can be water.

Referring to claim 16, Sneh discloses that the booster chambers are connected to gas supplies (105 and 105') (figure 1, paragraph 83).

Referring to claim 17, it is inherent that the chemical-dosage shut-off valves must be closed when filling the booster chambers from the precursor gas supply to prevent unwanted transport of the precursor gas to the reaction chamber.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Satta et al. (US Patent No. 6,391,785) in view of Sneh.

Referring to claims 18 and 19, Satta et al. discloses a method for forming a titanium nitride barrier layer using an ALD process. The method uses $TiCl_4$ as the first reactant and NH_3 as the second reactant (table 1, column 12 lines 23-28). However, Satta et al. does not disclose using a booster chamber as a method of performing the ALD reaction. The method of Sneh teaches that ALD is preferably practiced with the highest possible flow rate of purge gas and the lowest possible flow rate of reactants (paragraph 34). Sneh also proposes a method that teaches using booster chambers to help maximize the flow of the purge gas and minimize the flow of the reactant gasses, as discussed above this method meets all the requirements of claims 11 and 16. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Satta et al. to use the method suggested by Sneh with an

expectation that it will achieve significant modulation of flow rates between the reactant gas and purge gas steps.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sneh as applied to claims 11-17 above, and further in view of Kang et al. (US Patent No. 6,287,965). Sneh discloses using nitrogen as a purge gas for an ALD process, but does not disclose using argon. However, Kang et al. teaches using either nitrogen or argon as a purge gas for an ALD reaction (column 13 lines 36-49). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sneh to use argon as a purge gas instead of nitrogen as Kang et al. suggests that they are both capable of performing the exact same function.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard E. Abramowitz whose telephone number is 571-272-8557. The examiner can normally be reached on monday-friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HEA

HEA

TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER